Hazard Resilient Coastal Communities
2012 Focus Team Report

Under the National Strategic Plan, Sea Grant supports the following Hazard Resilient Coastal Communities (HRCC) national goals: 1) widespread understanding of the risks associated with living, working, and doing business along the nation's coasts; 2) community capacity to prepare for and respond to hazardous events; and 3) effective response to coastal catastrophes.

Annually, each Sea Grant (SG) Program submits short "impact statements" (impacts) via the National SG Office reporting process (PIER). Impacts describe significant and verifiable economic, societal and/or environmental benefits of SG work. The HRCC Focus Team examined impacts from 2011 to:

1. Assess SG's progress towards its strategic plan focus area goals and outcomes;
2. Identify national impacts that should be highlighted in communication products and reporting;
3. Pinpoint gaps to achieve the focus area goals outlined in the National Strategic Plan (both for the most recent year and for the duration of the plan);
4. Identify emerging issues and new opportunities for Sea Grant.

Goal 1: *Widespread **understanding of the risks** associated with living, working, and doing business along the nation's coasts.*

The Focus Team highlighted a variety of outstanding impacts that describe the Sea Grant network's progress toward achieving Goal 1, widespread understanding of coastal risks. They felt that the network is moving in the right direction, especially given the ambitious scope of the goal (targeting millions of Americans).

Understanding coastal risks requires improving the science behind **risk forecasts**, and the Sea Grant network has funded such efforts for a variety of regionally relevant coastal hazards. In addition to short-term coastal risks, Sea Grant also advances understanding of longer-term risks posed by **climate change and variability**.

Advancing the science of coastal risk forecasting is the first step, but Sea Grant's mission also involves bringing this science to citizens living and working along the coasts. To do this, Sea Grant places an important focus on **communicating coastal risks** by tailoring relevant risk information to specific audiences. Finally, Sea Grant works at the local and regional level to help communities **understand their vulnerability** to storm flooding or climate change.

Developing and Improving Risk Forecasts

- ***Delaware Sea Grant efforts help NOAA partners improve forecasts and understand causes of surf zone injuries in Delaware***

Delaware Sea Grant worked with state agency, university, and medical partners to compile data on surf zone injuries along the Delaware Atlantic coast. The National Weather Service (NWS) Weather Forecasting Office (WFO) at Mt. Holly, NJ incorporated this data into the daily Surf Zone Forecast, improving the understanding of the societal and environmental factors correlating to risk of injury.

- ***Improving coastal flood forecasts along the south shore of Long Island through real-time monitoring and simulation of past major hurricane events***

New York Sea Grant-funded researchers at Stony Brook University produced a high-resolution storm surge prediction model that improves coastal flooding forecasts for the New York metropolitan region. The Stony Brook Storm Surge group has also worked with NOAA's Meteorological Development Lab and Stevens Institute of Technology to look at multi-model storm surge prediction for the area.

- ***Hawai'i Sea Grant's three-dimensional NEOWAVE model of tsunami generation is adopted internationally***

Hawai'i Sea Grant-funded researchers developed a state-of-the-art three-dimensional model of tsunami generation (NEOWAVE) and shared it internationally with countries such as Chile. In 2011, the Chilean government partnered with UNESCO to host a NEOWAVE workshop for agencies in Peru, Ecuador, Columbia, El Salvador, and Panama, who plan to use the model for inundation map development.

Understanding Risks of a Changing and Variable Climate

- ***Oregon Sea Grant research project develops methods to assess the effects of climate variability on coastal flooding vulnerability***

Oregon Sea Grant-funded researchers developed a model integrating two coastal hazards (dune overtopping and coastal erosion) into coastal vulnerability assessments over time scales ranging from individual storm events to multi-decadal trends influenced by climate change. The work found that changing trends in wave heights are as influential as sea level rise, if not more so, in increasing vulnerability. This information has been incorporated into regional hazard adaptation plans.

- ***Washington Sea Grant symposium spurs state initiative to address ocean acidification***

In November 2011, Washington Sea Grant convened the first-ever Symposium on Ocean Acidification, where scientists discussed concerns that increasing levels of dissolved carbon dioxide in the water column can dissolve shellfish exoskeletons and may be related to recent poor survival of oyster larvae in Northwest hatcheries. The following month, the governor of Washington State chartered a Blue Ribbon Panel on Ocean Acidification to better understand and respond to threats posed by acidification.

Communicating Risk to Coastal Residents

- ***Oregon Sea Grant increases hazard resilience by increasing awareness of Oregon coast earthquake and tsunami risk***

Oregon sits on the Cascadia Subduction Zone, which generates high-magnitude earthquakes and devastating tsunamis every 300-500 years. Oregon Sea Grant faculty provided comprehensive outreach

and training to prepare communities and individuals for the likelihood and impacts of such an event. All seven Oregon coastal counties have now earned the NWS "Tsunami Ready" designation.

- ***North Carolina Sea Grant improves hurricane hazard information for Spanish-speaking populations***

In 2011, North Carolina Sea Grant researchers interviewed Spanish-speaking residents of Pitt County, NC to identify how they obtain and use information on tropical storm and hurricane forecasts. The team then developed hurricane, tornado, and winter storm information fact sheets in Spanish and partnered with the Association of Mexicans in North Carolina (AMEXCAN) to distribute the materials.

- ***Coastal communities improve risk communication and take first steps to address climate change***

Mississippi-Alabama Sea Grant interviewed leaders in two coastal communities regarding their perceptions of climate change risk. Results from these interviews were used to guide steps to increase risk communication in the communities, which are now each taking action to plan for sea level rise adaptation.

Helping Communities Assess Vulnerability

- ***Coastal Resilience Index promotes coastal communities' resilience to storms***

Mississippi-Alabama Sea Grant developed the Coastal Resilience Index (CRI) as a guided self-assessment tool to help community leaders gauge vulnerability to storm events and preparedness for recovery, and its application has spread across the Gulf Coast. At the request of local officials, Texas Sea Grant guided community leaders in the City of Ingleside, TX, through assessing the city's CRI, and now the city is now actively addressing identified weaknesses.

- ***VCAPS model assists coastal communities in planning for and adapting to the consequences of climate change***

South Carolina Sea Grant and partners developed the Vulnerability and Consequences Adaptation Planning Scenario (VCAPS) process to provide a facilitated framework to guide coastal managers through discovering for themselves the impacts of climate on coasts. Its successful application on Sullivan's Island has led to its extension to two other Carolinas communities, and there are plans to bring it to Massachusetts, Puerto Rico, and other locations in the future.

- ***Washington Sea Grant brings together scientists, managers, and fishermen to assess the vulnerability of West Coast fisheries to climate change***

Washington Sea Grant led the West Coast Sea Grants and other partners in the collaborative development of an innovative framework for assessing the vulnerability of fisheries to climate change. The effort culminated in a workshop attended by scientists, managers, and fishermen representing four West Coast fisheries. The participants found the framework a useful starting point for understanding and planning for the effects of climate change on fisheries.

Goal 2: *Community **capacity to prepare** for and respond to hazardous events*.

The Focus Team also highlighted several examples of progress toward Goal 2, which moves beyond understanding coastal risks to acting on that understanding by preparing for hazardous events. Sea Grant extension agents across the network work with homeowners, insurance companies, local officials, coastal managers, and emergency planners to improve community preparedness and resilience. On the smallest scale, Sea Grant programs create and distribute resources, conduct demonstration projects, and support insurance credit programs to promote homeowner resilience directly. At the community-wide scale, Sea Grant collects data and develops tools to help communities plan for and mitigate shoreline erosion. Finally, Sea Grant also conducts outreach and planning efforts to help communities take the first steps toward adapting to a changing climate.

Promoting Homeowner Resilience

- ***Hawai'i Sea Grant increases community capacity to prepare for hazardous events through outreach activities associated with the Homeowner's Handbook publication***

In 2011, Hawai'i Sea Grant updated their Homeowner's Handbook publication and held ten workshops (statewide and regional) to conduct supporting outreach activities. Hawai'i Sea Grant has been working with five other state Sea Grant programs (the four Gulf Coast programs plus Delaware) to adapt the handbook to their own regional hazards.

- ***Fortified home demonstration projects highlight the advantages of implementing more resilient building practices***

Mississippi-Alabama Sea Grant supported outreach efforts for three local demonstration projects, sponsored by insurance agencies and Habitat for Humanity, which showed homeowners, builders, and community leaders different approaches to building to "code plus" (above code standards). The improved resilience is expected to bring a nearly 5:1 return on investment through avoided losses.

- ***Homeowners receive wind-mitigation insurance credits***

North Carolina Sea Grant organized three training classes to certify home inspectors and builders as Fortified Evaluators, who can perform inspections to reward resilient homeowners with wind insurance discounts. More than 850 homes have earned credits for basic wind mitigation efforts through a credit program that North Carolina Sea Grant specialists recommended to state officials. Other homes (including seven new homes constructed in 2011) were awarded the stronger Fortified Home certifications.

Preparing Communities for Shoreline Erosion

- ***Coastal communities and the National Park Service incorporate Georgia Sea Grant-funded tool into planning***

Georgia Sea Grant-funded researchers developed AMBUR (Analyzing Moving Boundaries Using R) to analyze shoreline change along barrier islands, inlets, and estuaries and to calculate accurate erosion and accretion rates. Following workshops and meetings, the AMBUR tool has been put to use to improve resiliency planning in the communities of Jekyll Island, Tybee Island, and Savannah, as well as the National Park sites Fort Frederica, Fort Pulaski, and Cumberland Island.

- ***Bayshore Communities design 'Living Shorelines' to mitigate coastal hazards***

New Jersey Sea Grant's Coastal Processes Specialist worked with several communities to develop "Living Shorelines" design concepts to replace failing bulkheads and participated in a regulatory workshop focused on removing legal barriers to adopting such approaches.

- ***New York Sea Grant helps Port Jefferson, New York become resilient***

New York Sea Grant helped the Village of Port Jefferson secure funding sources for beach restoration and understand the coastal processes affecting its erosion—including the effect of a nearby inlet owned by another town. New York Sea Grant helped Port Jefferson work with the adjacent town and the Army Corps of Engineers to select a long-term management alternative that will improve navigation safety and protect and enhance public recreational facilities.

- ***Maine Sea Grant beach monitoring data informs development decisions***

Through the Maine Sea Grant-coordinated Southern Maine Beach Profiling Program, volunteers collect data on changes in beach shape and elevation. In 2011, the data provided input to regulatory decisions allowing dune restoration and renovations at Old Orchard Beach. The renovation work moved three buildings landward and raised them up to better protect them from coastal hazards and sea level rise.

Helping Communities Adapt to Climate Change

- ***California-based Sea Grants partner to conduct California Adaptation Needs Survey***

University of Southern California (USC) Sea Grant and California Sea Grant, along with 13 other partners, developed a statewide climate adaptation needs survey for coastal managers. Results from the nearly 600 responses provided insight into the types of information, tools, and training that coastal managers need to begin to adapt to climate change.

- ***Outreach and education efforts result in the integration of climate change considerations into State All-Hazard Mitigation planning initiative***

Delaware Sea Grant and partners held a series of workshops and meetings for the natural hazard mitigation community to foster consideration of climate change impacts when examining natural hazard threats. In 2011, the Delaware Emergency Management Agency decided to incorporate climate change consideration s into the State All-Hazard Mitigation Plan.

- ***Pennsylvania Sea Grant helps the City of Chester incorporate climate adaptation planning objectives into its Vision 2020 Comprehensive Plan***

As an extension of work begun during the September 2010 *Delaware County Roadmap for Adapting to Coastal Risks* Workshop, Pennsylvania Sea Grant worked with the City of Chester to incorporate climate adaptation planning objectives into its Vision 2020 Comprehensive Plan with the aim of making this tidal riverfront community more resilient.

Goal 3: *Effective **response** to coastal catastrophes.*

In considering progress toward Goal 3, the Focus Team reiterated comments from previous reviews on the goal's wording. First, *response* to coastal catastrophes is not necessarily within Sea Grant's purview, though a few 2011 impacts reflect examples of Sea Grant's work improving communities' *capacity* for disaster response. Rather, recognizing that Sea Grant's niche may be better situated in aiding long-term recovery, the Focus Team agreed to consider that dimension as well. Second, a program's ability to demonstrate its impacts in this area is contingent on a coastal disaster occurring in a region, and a lack of reported impacts in the response/recovery vein may reflect circumstances more than the Sea Grant network's overall effort.

Only a relatively small number of 2011 impacts pertained to Goal 3. The Focus Team chose to highlight two examples from Virginia of communities and businesses applying Sea Grant-developed tools effectively to make decisions during their **responses to Hurricane Irene** in August of 2011. The Focus Team also noted a major impact from Louisiana that describes the culmination of a multi-year project aiding a fishing community's **recovery from Hurricane Katrina**.

Effective response to storm events

- ***Accurate flood forecasting system prompts timely evacuation during Hurricane Irene***

Virginia Sea Grant sponsored training of emergency managers and weather service meteorologists in Rstofs, a flood forecasting system that was used extensively by the National Weather Service and emergency managers. The tool assisted decision-makers in calling a timely evacuation of 200,000 residents during Hurricane Irene, and its forecasts turned out to be accurate and informative.

- ***Real-time tide monitoring system empowers coastal business during Hurricane Irene***

Virginia Sea Grant sponsored the development and dissemination of real-time tide monitoring technology (TideWatch). With information from TideWatch, marinas were able to properly prepare for the drastic tidal changes produced by storms Ida (2009) and Irene (2011) and avoid the damages they accrued during similar, earlier storm events.

Effective long-term recovery from natural disasters

- ***Louisiana Sea Grant leads Bucktown Harbor Complex Development***

Culminating six years of Louisiana Sea Grant's efforts to work with fishermen, local public officials, and state development programs in securing funding, planning, contracting, and finalizing the project, a historic commercial fishing harbor destroyed in Hurricane Katrina was rebuilt and expanded to become a permanent home for Jefferson Parish commercial fishermen and a publically-operated mooring facility for Jefferson Parish recreational fishermen. It was officially dedicated January 2012.

GAPS AND EMERGING THEMES IN SEA GRANT'S HAZARD RESILIENT COASTAL COMMUNITIES WORK

In addition to reviewing the progress toward the national strategic goals, the Focus Team reviewed the impacts to gauge whether they were filling previously-identified gaps (enumerated in the 2010 Annual Report), to identify additional areas needing attention, and to recognize emerging themes that cross-cut the strategic goals.

Gaps Identified in 2010

In the HRCC 2010 Annual Report, the Focus Team identified three gaps:

- Tools for understanding the intersection of **coastal processes** and **climate change**
- Guidance for communities on **how to plan** for projected climate change impacts
- Field relationships with the **Federal Emergency Management Agency** (FEMA)

This year, the Focus Team discussed whether the 2011 reported impacts better addressed these previously identified gaps.

Intersection between coastal processes and climate change

The 2010 Annual Report noted tools for measuring shoreline erosion, considering setbacks, and for projecting future erosion in the context of estimated sea level rise were in development but had not yet reached the "impact" level. This year, the Focus Team found several examples of efforts focused on planning for and adapting to coastal erosion, highlighted under Goal 2. Two impacts in particular addressed the nexus of current coastal processes and future changes due to climate change: Georgia Sea Grant's AMBUR tool (pg. 4) (cited as an example "accomplishment" in the 2010 Annual Report), and Oregon Sea Grant's research integrating dune overtopping and coastal erosion hazards into long-term coastal vulnerability assessments that model the impacts of climate variability (pg. 2).

Guidance for communities on how to plan for climate change

The 2010 Annual Report noted Sea Grant successes in raising awareness and understanding of potential climate change impacts, but a lack of efforts aimed at guiding communities in how to prepare for these impacts. The 2011 impacts provided several examples of Sea Grant working with communities to incorporate climate adaptation measures into hazard or comprehensive plans, highlighted in Goal 2 (pg. 5). Furthermore, in the next few years, this gap will be addressed more visibly as Sea Grant programs report the impacts of their Community Climate Change Adaptation Initiative (CCCAI) projects.

Field relationships with FEMA

The 2010 Annual Report noted a gap in Sea Grant efforts that represent partnership or engagement with FEMA at the local scale. A particularly notable 2011 impact from New York Sea Grant demonstrated a case in which Sea Grant **served as a liaison** between the FEMA scientists creating floodplain maps and communities whose insurance rates depend on them (see below), and Sea Grant's involvement resulted in re-evaluation of local floodplain maps.

In general, however, the Focus Team recognized this as an ongoing gap and discussed suggestions for ways to move forward. The 2010 Annual Report suggested that Sea Grant programs help communities

overlay sea level rise projections onto FEMA's Flood Insurance Rate Maps (FIRMs), but the Focus Team noted that communities have been very reluctant to try this, uninterested in seeing their insurance rates rise further. Instead, the Focus Team suggested increasing engagement with floodplain managers and helping communities participate in FEMA's Community Rating System (CRS) to improve resilience in exchange for lower insurance premiums. This engagement may be increasingly in demand as communities adjust to rate increases brought by the Biggert-Waters Flood Insurance Reform Act of 2012 and to potential updates to floodplain maps.

Serving as a liaison between coastal communities and FEMA

- ***Promoting the best-available information for flood hazard management decisions***

A New York Sea Grant specialist worked with NY SG-funded researchers to assess the accuracy and uncertainty of models used to create Flood Insurance Rate Maps (FIRMs) and to identify sources of local long-term water level data that could improve the models' accuracy and resolution. As a result, FEMA re-evaluated the model and update the FIRM. New York Sea Grant's work with local communities ensured that the best-available information was used to manage flood hazards.

Additional Gaps

Soft engineering trends for shoreline erosion control

Shoreline erosion is a concern for coastal communities across the nation. The 2011 impacts provide some excellent examples of tools to map and understand erosion rates and hazards, as well as some activities helping communities consider management alternatives. There is particular interest in considering these alternatives in rebuilding and fortifying Sandy-damaged coastlines along New Jersey, New York, and Connecticut. Sea Grant can position itself as a leader in investing in research on new "soft" engineering techniques, analyzing trends in and results of its application, and engaging with communities to help them understand their options.

Robust evaluation of outreach and education activities

Several HRCC impacts involve educating communities about coastal risks and strategies to improve resilience. However, the Focus Team remarked that while these activities are noteworthy and in some cases reach large audiences, it is difficult to truly gauge their impacts without efforts to track changes in behavior resulting from Sea Grant's work.

Emerging Themes and Other Highlights

The Focus Team highlighted a few other impacts that stand out from the earlier themes and which reflect emerging areas:

- **Regional Ocean Planning and Risk Management** – As regional efforts to balance ocean uses ramp up, Sea Grant can promote incorporating short- and long-term risk management into these considerations and continue to facilitate agencies and stakeholders working together to reach sustainable solutions.

- **Legal Implications for Planning for Sea Level Rise** – As communities begin to consider strategies for preparing for sea level rise, Sea Grant's resources for conducting applied legal research represent a great asset.

- **Stormwater Management for Flood Control** – One of many areas in which hazard mitigation overlaps with sustainable development, Sea Grant researches and applies innovative strategies for managing stormwater runoff, reducing both the amount of pollution entering nearby waterways and the risks of flooding, particularly in urban areas. Increasingly, Sea Grant programs are working to incorporate climate change considerations into stormwater management discussions.

- **Transfer of Tools and Resource among Sea Grant Programs** – Several of the outstanding impacts in this report represent examples of Sea Grant work that has been transferred from one program to another (i.e., Coastal Resilience Index, Homeowner's Handbook, VCAPS). While such transfers are not new, a concerted effort to track and analyze these transfers would be interesting and helpful.

Regional Ocean Planning and Risk Management

- ***Fostering the development of the Governors' South Atlantic Alliance***

In 2009, the Governors of Florida, Georgia, and North and South Carolina established the Governor's South Atlantic Alliance (GSAA) to increase regional collaboration in managing and sustaining coastal and ocean ecosystems in the face of short-term and long-term changes.
South Carolina Sea Grant was invited to serve as the GSAA's administrative and fiscal agent. With Sea Grant's help, the GSAA successfully applied for FY11 NOAA funding for coastal and ocean planning.

Legal Implications for Planning for Sea Level Rise

- ***Gulf of Mexico Sea Grant legal research on takings law informs judicial analysis***

Mississippi-Alabama Sea Grant Legal Program partnered with Florida Sea Grant, Louisiana Sea Grant, and Texas Sea Grant to conduct legal research on the impact of the regulatory takings doctrine on local governments' ability to implement sea level rise adaptation policies. This work informed the legal debate in a recent decision regarding the Texas Open Beaches Act.

Stormwater Management for Pollution and Flood Control

- ***Nearly 13,000 acres in Illinois are drained by green infrastructure stormwater management techniques***

Drawing on results from an Illinois-Indiana Sea Grant study that found green infrastructure to be as effective and less expensive than conventional stormwater infrastructure, the state of Illinois has awarded $4.8 million to communities and organizations for its installation, improving stormwater retention on nearly 13,000 acres.

- ***The Coastal Alabama and Mississippi Rain Barrel Program reduces residential stormwater impacts***

Mississippi-Alabama Sea Grant's rain barrel workshops and low-impact development (LID) demonstration sites have helped raise awareness and educate the public about water-quality impacts associated with urban stormwater runoff, leading to a reduction of more than 200,000 gallons of stormwater per year.

GENERAL COMMENTS ON IMPACT REPORTING AND THE REVIEW PROCESS

The HRCC Focus Team's Annual Review conducts a survey of reported impacts to provide critique and help piece together a picture of Sea Grant's efforts toward the area on a national scale.

This year, the Focus Team debated whether all of the 2011 reported impacts truly reached the level of "impact" instead of "accomplishments," though they acknowledged improvements in this distinction over earlier reporting years. The Focus Team was most impressed by impacts that clearly demonstrate Sea Grant's role and which represent a direct relationship with a community and measurable change as a result. Conversely, some impacts were highlighted for their ambition and the scale—sometimes breadth, sometimes specificity—of their target audience.

The Focus Team also noted the range of activities that different Sea Grant Programs categorize as "hazard resilience," a term whose definition differs with the hazards that each region faces. In general, hazard resilience remains a relatively new focus for Sea Grant, and the impacts of Programs' efforts so far are still evolving.